

CIRCULAR

① $r = 8 \text{ cm}$
 $v = 45 \text{ km/h} \quad (12,5 \text{ m/s})$
 $\omega = ?$

$$\omega = \frac{v}{r} \Rightarrow \omega = \frac{12,5 \text{ m/s}}{8 \text{ cm}} \Rightarrow \omega = 1,56 \frac{1}{s}$$

②



$$D = 3 \text{ cm}$$

$$r = 1,5 \text{ cm}$$

$$n = 120 \text{ rpm}$$

$$f = ?$$

$$T = ?$$

$$\omega = ?$$

$$\omega = \frac{\pi \cdot n}{30} \Rightarrow \omega = 12,56 \text{ rad/s}$$

$$f = \frac{n}{60} \Rightarrow f = 2 \text{ Hz}$$

$$T = \frac{1}{f} \Rightarrow T = 0,5 \frac{1}{s}$$

$$v = \omega \cdot r \Rightarrow v = 18,84 \text{ m/s}$$

③ $\omega_0 = 6,28 \text{ rad/s}$

$$\alpha = 1,57 \text{ rad/s}^2$$

$$t = 16 \text{ s}$$

$$\omega_f = ?$$

$$n = ?$$

$$\omega_{f-402m} =$$

$$v = \omega_f \cdot r \Rightarrow 12,56 \text{ m/s}$$

$$\omega = 6,28 \text{ rad/s} + 1,57 \text{ rad/s}^2 \cdot 16 \text{ s}$$

$$\omega_f = 31,4 \text{ rad/s}$$

$$\omega_f = \frac{\pi \cdot n}{30} \Rightarrow \omega_f \cdot 30 = n \Rightarrow n = 299$$

$$\frac{(31,4)^2 - (6,28)^2}{2 \cdot 1,57} = \Delta \theta \Rightarrow \Delta \theta = 301,4$$

$$N = \frac{\Delta \theta}{2\pi} \Rightarrow N = 47,97 \text{ rpm}$$

$$\omega^2 = \omega_0^2 + 2 \cdot \alpha \cdot \Delta \theta$$

$$\frac{\omega^2 - \omega_0^2}{2 \cdot \alpha} = \Delta \theta$$

$$1) \omega_0 = 100 \text{ rpm} (10,47 \text{ rad/s}) \quad \omega = \omega_0 + \alpha \cdot t$$

$$\omega_f = 1200 \text{ rpm} (125,66 \text{ rad/s}) \quad \frac{\omega - \omega_0}{t} = \alpha \Rightarrow \frac{125,66 - 10,47}{10} = \alpha$$

$$\Delta t = 10 \text{ s}$$

$$\alpha = ?$$

$$N = ?$$

$$2) \alpha = 11,51 \text{ rad/s}^2$$

$$\omega^2 = \omega_0^2 + 2\alpha \Delta\theta \Rightarrow \frac{\omega_f^2 - \omega_0^2}{2\alpha} = \Delta\theta \Rightarrow \frac{(125,66)^2 - (10,47)^2}{2 \cdot 11,51} = \Delta\theta$$

$$\Delta\theta = 681,16 \text{ rad}$$

$$N = \frac{\Delta\theta}{2\pi} \Rightarrow N = 108 \text{ VUELTAS}$$

$$5) \omega_0 = 1500 \text{ rpm} (157,07 \text{ rad/s})$$

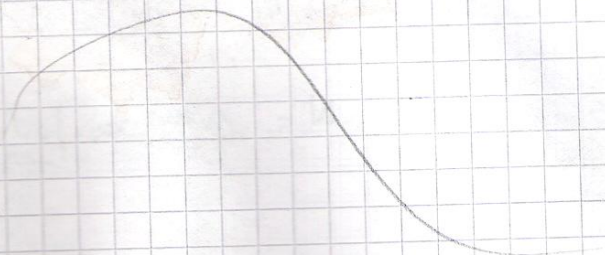
$$VUELTAS = 150$$

$$N = \frac{\Delta\theta}{2\pi} \Rightarrow 2\pi \cdot N = \theta \Rightarrow 942,47 \text{ rad} = \theta$$

$$\omega^2 = \omega_0^2 + 2\alpha \cdot \Delta\theta \Rightarrow \frac{-\omega_0^2}{2\Delta\theta} = \alpha \Rightarrow \frac{-(157,07 \text{ rad/s})^2}{2 \cdot 942,47 \text{ rad}} = \alpha$$

$$\alpha = \frac{-(24.670,88) \text{ rad/s}^2}{1.884,94 \text{ rad}} \Rightarrow \alpha = -13,08 \text{ rad/s}^2$$

$$\alpha = \frac{\Delta\omega}{\Delta t} \Rightarrow \frac{\Delta\omega}{\alpha} = \Delta t \Rightarrow \Delta t = \frac{157,07 \text{ rad}}{-13,08 \text{ rad/s}^2} \Rightarrow \Delta t = 12 \text{ s}$$



6) $\omega_0 = 25,2 \text{ rad/s}$

$\Delta t = 19,7 \text{ s}$

$\alpha = ?$

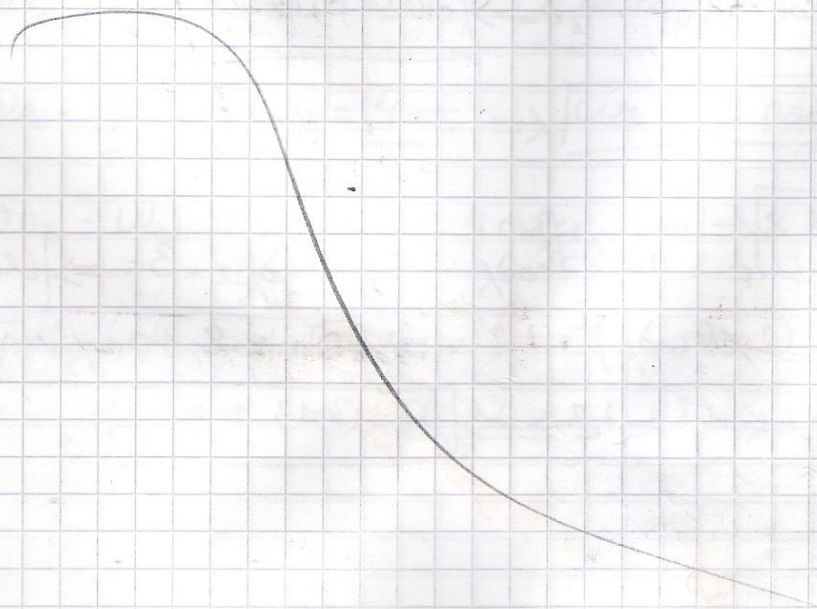
$N = ?$

$$\alpha = \frac{-\omega_0}{\Delta t} \Rightarrow \alpha = \frac{25,2 \text{ rad/s}}{19,7 \text{ s}} \Rightarrow \boxed{\alpha = -1,27 \text{ rad/s}^2} \quad \checkmark$$

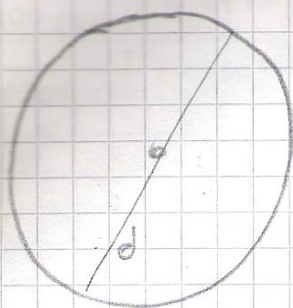
$$\omega^2 = \omega_0^2 + 2\alpha \Delta \theta \Rightarrow \frac{-\omega_0^2}{2\alpha} = \Delta \theta \Rightarrow \frac{-635,04 \text{ rad}^2/\text{s}^2}{-2,54} = \Delta \theta$$

$$\boxed{\Delta \theta = 250,01 \text{ rad}}$$

$$N = \frac{\Delta \theta}{2\pi} \Rightarrow N = \frac{250,01 \text{ rad}}{2\pi} \Rightarrow \boxed{N = 39, \text{ VUELTAS}} \quad \checkmark$$



7



$$d = 2,4 \text{ m} \quad (r = 1,2 \text{ m})$$

$$\omega_0 = 100 \text{ rpm} \quad (10,47 \text{ rad/s})$$

$$\omega_f = 0 \text{ rpm}$$

$$\Delta t = 4 \text{ s}$$

$$a_n = ?$$

$$a_t = ?$$

$$\omega = \omega_0 + \alpha \cdot t$$

$$\frac{-\omega_0}{t} = \alpha \Rightarrow \alpha = -\left(\frac{10,47}{4 \text{ s}}\right) \Rightarrow \alpha = -2,61 \text{ rad/s}^2$$

PARA $t: 2 \text{ s}$

$$\omega_f = \omega_0 + \alpha \cdot t \Rightarrow \omega_f = 10,47 \text{ rad/s} - 2,61 \text{ rad/s}^2 \cdot 2 \text{ s} \Rightarrow \omega_f = 5,25 \text{ rad/s}$$

$$a_n = \omega^2 \cdot r \Rightarrow a_n = (5,25 \text{ rad/s})^2 \cdot 1,2 \text{ m} \Rightarrow a_n = 33,07 \text{ m/s}^2$$

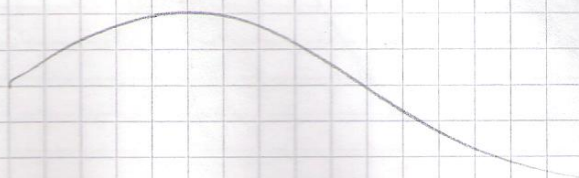
$$a_t = \alpha \cdot r \Rightarrow a_t = 2,61 \text{ rad/s}^2 \cdot 1,2 \text{ m} \Rightarrow a_t = 3,13 \text{ m/s}^2$$

PARA $t: 3 \text{ s}$

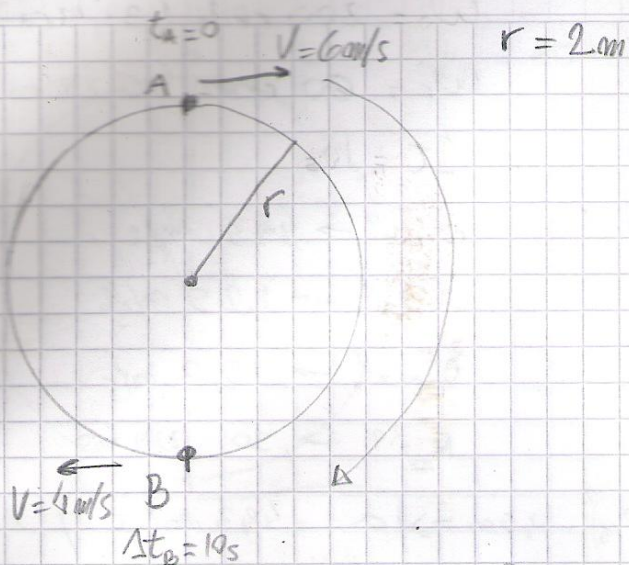
$$\omega_f = \omega_0 + \alpha \cdot t \Rightarrow \omega_f = 10,47 \text{ rad/s} - 2,61 \text{ rad/s}^2 \cdot 3 \text{ s} \Rightarrow \omega_f = 2,64 \text{ rad/s}$$

$$a_n = \omega^2 \cdot r \Rightarrow a_n = (2,64 \text{ rad/s})^2 \cdot 1,2 \text{ m} \Rightarrow a_n = 8,36 \text{ m/s}^2$$

$$a_t = \alpha \cdot r \Rightarrow a_t = 2,61 \text{ rad/s}^2 \cdot 1,2 \text{ m} \Rightarrow a_t = 3,13 \text{ m/s}^2$$



8)



a) $v_{\text{cm}} = 0,62 \text{ m/s}$

b) $\omega_{\text{cm}} = ? \rightarrow 0,31 \text{ rad/s}$

c) $\alpha = ? \rightarrow 0,1 \text{ s}^{-2}$

d) $a_{nA} = ? \rightarrow 18 \text{ m/s}^2$

$a_{nB} = ? \rightarrow 8 \text{ m/s}^2$

b) $\omega_{\text{cm}} = \frac{\Delta \theta}{\Delta t} \Rightarrow \omega = \frac{\pi}{10\text{s}} \Rightarrow \omega_{\text{cm}} = 0,31 \text{ rad/s}$

a) $v = \omega_{\text{cm}} \cdot r \Rightarrow \omega = 0,62 \text{ m/s}$

c) $\omega_A = \frac{v}{r} \Rightarrow \omega_A = \frac{6 \text{ m/s}}{2 \text{ m}} \Rightarrow \omega_A = 3 \text{ rad/s}$

$a_{nA} = \omega_A^2 \cdot r \Rightarrow (3 \text{ rad/s})^2 \cdot 2 \text{ m} \Rightarrow a_n = 18 \text{ m/s}^2$

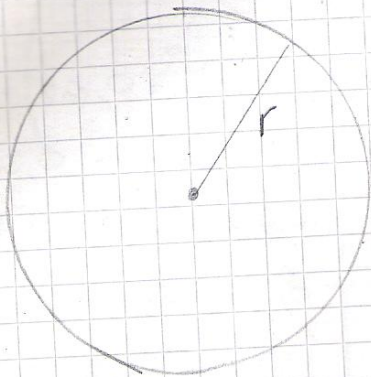
$\omega_B = \frac{v}{r} \Rightarrow \omega_B = \frac{4 \text{ m/s}}{2 \text{ m}} \Rightarrow \omega_B = 2 \text{ rad/s}$

$a_{nB} = \omega_B^2 \cdot r \Rightarrow a_{nB} = 4 \text{ rad/s}^2 \cdot 2 \text{ m} \Rightarrow 8 \text{ m/s}^2 = a_{nB}$

e) $\omega_A = \omega_B + \alpha \cdot t$

$\frac{\omega_A - \omega_B}{t} = \alpha \Rightarrow \frac{3 - 2}{10} = \alpha \Rightarrow \alpha = 0,1 \text{ s}^{-2}$

9



$$r = 50 \text{ cm} (0,5 \text{ m})$$

$$\omega_0 = 300 \text{ rpm} (31,41 \text{ rad/s})$$

$$\omega_f = 60 \text{ rpm} (6,28 \text{ rad/s})$$

$$\Delta t = 10 \text{ s}$$

$$a_n = ? \rightarrow 49,3 \text{ m/s}^2$$

$$a_t = ? \rightarrow 1,25 \text{ m/s}^2$$

$$v_t = ? \rightarrow 15,7 \text{ m/s}$$

$$N_{\Delta t} = ? \rightarrow 30 \text{ WOLTA}$$

$$a_n = \omega^2 \cdot r \Rightarrow a_n = (31,41 \text{ rad/s})^2 \cdot 0,5 \text{ m} \Rightarrow a_n = 49,3 \text{ m/s}^2$$

$$v_t = \omega \cdot r \Rightarrow v_t = 31,41 \text{ rad/s} \cdot 0,5 \text{ m} \Rightarrow v_t = 15,7 \text{ m/s}$$

PARA SACAR N:

$$\alpha = \frac{\omega_f - \omega_0}{\Delta t} \Rightarrow \alpha = \frac{6,28 \text{ rad/s} - 31,41 \text{ rad/s}}{10 \text{ s}} = -2,51 \text{ rad/s}^2$$

$$\frac{\omega_f^2 - \omega_0^2}{2\alpha} = \Delta \theta \Rightarrow \frac{(6,28)^2 - (31,41)^2}{2(-2,51)} = \Delta \theta \Rightarrow \Delta \theta = \frac{39,43 - 986,58}{(-5,02)} \Rightarrow$$

$$\Delta \theta = 188,67 \text{ rad}$$

$$N = \frac{\Delta \theta}{2\pi} \Rightarrow \frac{188,67 \text{ rad}}{2\pi} = N \Rightarrow N = 30 \text{ WOLTA}$$

$$a_t = \alpha \cdot r \Rightarrow a_t = -2,51 \text{ rad/s}^2 \cdot 0,5 \text{ m} \Rightarrow a_t = 1,25 \text{ m/s}^2$$

